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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte HONGTAO LI, FRANCOIS DROUX,
TOBIAS KJELLBERG, and JUERGEN HOFFMANN

Appeal 2015-000389
Application 13/431,400
Technology Center 3700

Before LINDA E. HORNER, BRANDON J. WARNER, and
JASON W. MELVIN, *Administrative Patent Judges*.

HORNER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Hongtao Li et al. (Appellants)[1] seek our review under 35 U.S.C. § 134 of the Examiner's decision, as set forth in the Final Action dated May 6, 2013 ("Final Act."), rejecting claims 1, 2, and 4–18.[2] We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] Appellants identify Alstom Technology Ltd. as the real party in interest. Substitute Appeal Brief, dated February 24, 2014, at 4 ("Appeal Br.").
[2] Claim 3 is canceled. Final Act. 2.

CLAIMED SUBJECT MATTER

Appellants' claimed subject matter relates to "power plants with integrated CO2 capture as well as CO2 capture ready power plants." Spec., para. 2. Claims 1, 6, 13, and 16 are independent. Claim 1 is illustrative of the subject matter on appeal and is reproduced below.

> 1. A power plant, with a CO2 capture system 12, comprising:
>
> at least one of a steam power plant 1 or a combined cycle power plant 2, wherein a water steam cycle of the power plant 1, 2 comprises two steam turbine arrangements 14, 15, the first steam turbine arrangement 14 comprising steam turbines with at least two pressure levels, and a second steam turbine arrangement 15 comprising at least one back pressure turbine 27 configured to expand steam to a supply pressure of the CO2 capture system 12, wherein the second steam turbine arrangement 15 further comprises a low-pressure steam turbine 28, which is designed for a supply pressure that matches an outlet pressure of the at least one back pressure turbine 27, and the at least one back pressure steam turbine 27 and the low-pressure steam turbine 28 are both configured for a steam mass flow of the CO2 capture system 12 in order to convert thermal energy of an outlet steam of the back pressure steam turbine 27 into mechanical energy when the CO2 capture system 12 is not operating.

EVIDENCE

The Examiner relied upon the following evidence in the Final Action:

Ross	US 4,271,473	June 2, 1981
Frutschi	US 5,148,668	Sept. 22, 1992

Rollins, III ("Rollins")	US 6,230,480 B1	May 15, 2001
Kataoka et al. ("Kataoka")	US 6,256,976 B1	July 10, 2001
Han et al. ("Han")	US 6,851,514 B2	Feb. 8, 2005
Iijima et al. ("Iijima")	US 7,488,463 B2	Feb. 10, 2009
Hustad et al. ("Hustad")	US 2009/0317315 A1	Dec. 24, 2009
Hegerland	WO 2007/081214 A1	July 19, 2007
Li et al. ("Li")	WO 2008/090167 A1	July 31, 2008

"Carbon Dioxide Capture from Existing Coal-Fired Power Plants," DOE/NETL-401/110907 ("DOE/NETL") (Nov. 2007).

REJECTIONS

The Final Action includes the following grounds of rejection:

1. Claims 1, 2, 4, 5, 12, and 16 stand rejected under 35 U.S.C. § 112, second paragraph, as indefinite.
2. Claims 1 and 12 stand rejected under 35 U.S.C. § 102(b) as anticipated by Hegerland.
3. Claims 2, 5, and 11 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hegerland and DOE/NETL.
4. Claims 4, 8, and 10 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hegerland and Frutschi.
5. Claim 9 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Hegerland and Iijima.

6. Claims 1, 2, 4, 5, 8, and 10–12 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Li, Ross, DOE/NETL, Frutschi, and Rollins.
7. Claim 9 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Li, Ross, DOE/NETL, Frutschi, Rollins, and Iijima.
8. Claims 6 and 7 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Li, Ross, Kataoka, Frutschi, DOE/NETL, and Rollins.
9. Claims 13–15 stand rejected under 35 U.S.C. § 103(a) as unpatentable over DOE/NETL, Frutschi, and Rollins.
10. Claim 16 stands rejected under 35 U.S.C. § 103(a) as unpatentable over DOE/NETL and Rollins.
11. Claims 17 and 18 stand rejected under 35 U.S.C. § 103(a) as unpatentable over DOE/NETL, Rollins, Hustad, and Han.

ANALYSIS

Examiner's Refusal to Enter After-Final Amendment

Appellants seek to have the Board enter an Amendment Under 37 C.F.R. § 1.116 that Appellants allege the Examiner improperly refused to enter. Appeal Br. 14–15. The Examiner's refusal to enter an amendment after issuance of a final rejection is a matter petitionable to the Director under 37 C.F.R. § 1.181, and is not within the jurisdiction of the Board. 37 C.F.R. § 1.127; *In re Berger*, 279 F.3d 975, 984 (Fed. Cir. 2002) (citing

In re Hengehold, 440 F.2d 1395, 1403–04 (CCPA 1971)); and *In re Mindick*, 371 F.2d 892, 894 (CCPA 1967).

First Ground of Rejection: Indefiniteness

The Examiner determines that certain language recited in claims 1, 4, and 5 renders the scope of these claims indefinite. Final Act. 4–9. As to all of the claims so rejected, the Examiner finds that "one of ordinary skill in the art at the time of the invention[] would not know the claimed operating/design parameters . . . of a generic CO2 capture system with an unknown CO2 capture percentage (full or partial CO2 capture) applied to a generic power plant of unknown power output and burning an unknown fuel." *Id.* at 5. Further, the Examiner determines that claims 2, 5, 12, and 16 recite relative terms that are indefinite because the claims and Specification do not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. *Id.* at 6 (discussing "different from" in claim 2); *id.* at 7 (discussing "smaller" and "higher" in claim 5); *id.* at 8–9 (discussing "space" in claims 12 and 16). Appellants argue that the Examiner is imposing "an improper demand for the recitation of specific values in the claims, or . . . an improper objection to a 'relative' term which is clear and definite when read in the context of the claim within which it appears." Appeal Br. 18.

With regard to the claimed CO2 capture system, the claims are intended to cover various types and sizes of CO2 capture systems based on

the design considerations of the power plant in which the system operates. The recited elements in claims 1, 4, and 5 whose scopes are dictated by specifications of the CO2 capture system are as accurate and precise as the subject matter permits. *See Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1576 (Fed. Cir. 1986) (determining that a claim reciting "said front leg portion is so dimensioned as to be insertable through the space between the doorframe of an automobile and one of the seats thereof" is as accurate as the subject matter permits, automobiles being of various sizes).

With regard to the "relative term" recited in dependent claim 2, we agree with Appellants that the phrase "different from" is clear and means "not the same." Appeal Br. 18. With regard to the terms "smaller" and "larger" recited in claim 5, as discussed *supra*, these terms are sufficiently definite based on the particular steam turbine arrangements selected for the particular CO2 capture system. With regard to the term "space" recited in claims 12 and 16, we agree with Appellants that one having ordinary skill in the art would understand the "space" required for the CO2 capture system based on the CO2 capture system selected. *Id.*; *see* DOE/NETL, page ES-9 (discussing that "four acres of new equipment space is needed for the amine-based capture and compression system and can be located in three primary locations on the existing 200-acre power plant site"); *see also id.* at 40, 80 (discussing "plot space requirement"). Appellants' Specification describes:

> The power plant further includes a space required for a CO2 capture system configured to remove CO2 from flue gas of the power plant, the space is arranged to allow retrofitting of the CO2

> capture system, and/or the plant includes flue gas ducting and a stack prepared for retrofitting a CO2 capture system. The method includes building the CO2 capture system in the space provided for the CO2 capture system while the power plant is operating.

Spec., para. 12. We find that one having ordinary skill in the art, upon reading the Specification and being familiar with the use of the term "space" in this field as shown in the art, would understand "space" to refer to a footprint (area) needed to house the CO2 capture system.

For these reasons, we do not sustain the first ground of rejection of claims 1, 2, 4, 5, 12, and 16 under 35 U.S.C. § 112, second paragraph, as indefinite.

Second Ground of Rejection

Appellants argue claims 1 and 12 as a group. Appeal Br. 19–20. We select claim 1 as representative of the group, and claim 12 stands or falls with claim 12. 37 C.F.R. § 41.37(c)(1)(iv).

Appellants argue that Hegerland does not anticipate claim 1 because it "does not disclose Appellants' second steam turbine arrangement 15 as presently claimed." Appeal Br. 19. In particular, Appellants contend that "[i]n Hegerland, . . . the back pressure steam turbine 17 does not feed steam TO a lower pressure steam turbine as presently claimed." *Id.*; *see also id.* at 20 (arguing that "there is no low pressure steam turbine downstream of any higher back pressure steam turbine in Hegerland's power plant"). Appellants further argue that Hegerland "does not address using a back pressure steam turbine (e.g., Appellants' back pressure steam turbine 27) to

selectively feed a lower pressure steam turbine 28 or a CO2 capture system." *Id.* at 20 (arguing "the dual use functionality of Appellants' claimed second steam turbine arrangement 15 is not realized in the Hegerland document").

The Examiner responds that, in Hegerland, "steam turbine (18) reads on a lower pressure steam turbine because steam turbine (18) receive[s] lower pressure steam, i.e., previously expanded steam, compared to the higher pressure steam supplied to back pressure steam turbine (37)." Ans. 15; *see also* Final Act. 10 (identifying Hegerland's back pressure turbine (37) as the claimed back pressure turbine of the second steam turbine arrangement, and low-pressure steam turbine (18) as the claimed low pressure turbine of the second steam turbine arrangement).

Appellants respond that "regardless of which steam turbine (17) or (18) of Hegerland is a 'lower' or 'higher' steam turbine . . . neither provides the two steam turbine arrangement and CO2 capture system of Appellants' independent claims that can selectively activate a CO2 capture system or a second steam turbine." Reply Br. 4.

Hegerland discloses an embodiment including "a back pressure steam turbine 37" that "suppl[ies] intermediate pressure steam through the pipeline 39 to the back pressure turbines 17 and 18." Hegerland 11:5–8 (describing embodiment of Figure 2). Hegerland describes that "all the steam required by the CO_2 absorption process has to be generated in the boiler 26 at a high pressure of more than 100 bar, and expanded in the back pressure turbines 37, 17 and 18 before it enters the stripping column 13 through the supply line 23." *Id.* at 11:9–12; *see id.* at 14:15–17 (claiming that "operation of the

secondary CO_2 generating process is tuned to provide the adequately tempered steam required to run the desorption process in the at least one desorption columns"). Thus, as noted by the Examiner (Ans. 18), Hegerland's back pressure turbine 37 receives steam at a relatively high pressure, expands the steam to an intermediate, relatively lower pressure, and sends the expanded steam on to turbine 18. Appellants' arguments have not specifically addressed this finding of the Examiner as to Hegerland's back pressure steam turbine 37 and thus, have not demonstrated error in this finding.

Further, the Examiner's annotated Figure 2 of Hegerland depicts back pressure steam turbine 17 as part of the CO2 capture system. Final Act. 12. Appellants have not addressed this finding by the Examiner so as to demonstrate error with this position. We understand Hegerland to send expanded steam from back pressure steam turbine 37 directly to back pressure steam turbine 17. Hegerland, Fig. 2 (showing pipeline connecting pipeline 39 to inlet of back pressure steam turbine 17). As such, we agree with the Examiner's finding, as denoted in annotated Figure 2 of Hegerland, that back pressure steam turbine 37 is "configured to expand steam to the supply pressure of a CO2 capture system." Final Act. 10. Further, we agree with the Examiner's finding that Hegerland's turbine 18 receives steam from back pressure turbine 37 at a lower pressure than the pressure at which the steam is received by back pressure turbine 37, such that Hegerland's turbine 18 is a "low-pressure turbine . . . which is designed for a supply pressure that

matches an outlet pressure of [Hegerland's back pressure turbine 37]," as called for in claim 1. Ans. 15.

Claim 1 further recites "the at least one back pressure steam turbine 27 and the low-pressure steam turbine 28 are both configured for steam mass flow of the CO2 capture system 12 in order to convert thermal energy of an outlet steam of the back pressure steam turbine 27 into mechanical energy when the CO2 capture system 12 is not operating." Appeal Br., Claims App. 1. Appellants contend that "[t]hese features allow output power of the power plant to be increased by the 'two steam turbine arrangements' when the CO2 capture system is not in use." Appeal Br. 20. As noted by the Examiner (Ans. 18), Hegerland discloses that an objective of the invention "is to obtain a method and plant for capturing and separating CO_2 from flue gases that may be run independently of the CO_2 generating process." Hegerland 4:36–37. We agree with the Examiner's understanding of this disclosure in Hegerland to mean that "the second steam turbine arrangement may be run independently of the CO2 capture system." Ans. 18.

For these reasons, we agree with the Examiner's determination that Hegerland discloses the subject matter of claim 1. Accordingly, we sustain the rejection of claim 1, and claim 12 which falls with claim 1, under 35 U.S.C. § 102(b) as anticipated by Hegerland.

Third through Fifth Grounds of Rejection

Appellants contend that the additional references DOE/NETL, Frutschi, and Iijima, relied upon in combination with Hegerland in the

rejections of dependent claims 2, 4, 5, and 8–11, "considered individually or in combination with the Hegerland document, [fail to] overcome the already discussed deficiencies of the Hegerland document" with respect to claim 1. Appeal Br. 21. Because we find no deficiencies in the anticipation rejection of claim 1 based on Hegerland, we likewise sustain the third through fifth grounds of rejection of claims 2, 4, 5, and 8–11.

Sixth Ground of Rejection

Appellants argue claims 1, 2, 4, 5, and 10–12 as a group. Appeal Br. 22–23, 27. We select claim 1 as representative of this group. Claims 2, 4, 5, and 10–12 stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv). Appellants present additional arguments for dependent claim 8, which we address *infra*.

Claim 1

The Examiner finds that Li teaches a power plant with two steam turbine arrangements (13, 15) where the second steam turbine arrangement (13) includes a back pressure steam turbine[3] (13) configured to expand steam to the supply pressure of the CO2 capture system. Final Act. 23. The

[3] The Examiner relies on Ross to show that it was understood in the art at the time of Appellants' invention that "back pressure turbine" was a "term used to describe a steam turbine that expands steam from a high pressure to a lower pressure where the lower pressure steam retains sufficient thermal energy to perform work, i.e., steam hasn't condensed into water." Final Act. 23–24 (citing Ross, col. 2, ll. 25–50, Fig. 2). Appellants do not contest the Examiner's reliance on Ross for this teaching. Appeal Br. 23 (arguing only that Ross "discloses a single turbine arrangement with turbines 16 and 24").

Examiner proposes to modify Li with the teaching of DOE/NETL such that the first steam turbine arrangement comprises steam turbines with at least two pressure levels, as was conventional in the art at the time of Appellants' invention. *Id.* at 24. The Examiner further proposes to modify Li with the teaching of Frutschi, to add a low pressure steam turbine to Li's second steam turbine arrangement that is designed for a supply pressure that matches an outlet pressure of a back pressure turbine, as was known in the art at the time of Appellants' invention. *Id.* at 25. The Examiner further finds that DOE/NETL teaches that the CO2 capture system consumed 130,461 kWh of power plant output when operating, and Rollins teaches that, in 1999, power plants were selling electricity at $30/MWh ($0.03/kWh) for normal periods and as high as $500/MWh ($0.50/KWh) during peak power demand periods. Final Act. 26–27. Based on this knowledge of one of ordinary skill in the art, the Examiner determines it would have been obvious to modify Li "to convert thermal energy of an outlet steam of the back pressure steam turbine into mechanical energy when the CO2 capture system is not operating" in order "to generate electricity which could generate revenues of $3,913 to $65,230 per hour at 1999 power prices."[4] *Id.* at 27.

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[4] Appellants argue that Rollins "discloses a combined cycle power plant with a single turbine arrangement having low, intermediate and high pressure sections." Appeal Br. 23. Appellants do not contest the Examiner's reliance on Rollins to teach the price of electricity in 1999 or the Examiner's proposed modification of Li with the teaching of DOE/NETL and Rollins to

Appellants contend that "Li . . . as cited in combination with Ross, Frutschi, DOE/NETL and Rollins, fails to disclose or suggest any expansion of steam using a low pressure turbine to match an outlet pressure of a back pressure turbine to selectively supply power to a CO2 capture system." Appeal Br. 22–23. Appellants contend that Li "discloses a power plant with a single gas turbine 1 and a CO2 capture system 3." *Id.* at 23.

Li discloses more than Appellants acknowledge. As noted by the Examiner, Li discloses heat recovery steam generator unit 2 that sends a portion of the steam generated therein via line 12 to second expander 13. Li, 10:26–11:5. High-pressure steam from expander 13 is used to drive CO2 compressor 24 of CO2 capture unit 3. *Id.* at 11:29–31. Low-pressure steam is led from expander 13 via line 26 to regenerator 21 of CO2 capture unit 3 to provide at least part of the heat needed to heat up the regenerator. *Id.* at 11:31–12:2. Li discloses that another portion of the steam generated by heat recovery steam generator unit 2 is sent via line 14 to steam turbine 15 coupled to generator 16 to produce additional power. *Id.* at 11:5–7. Thus, Li discloses a power plant having two steam turbine arrangements, wherein one steam turbine arrangement 15 is used to generate additional power, and the other steam turbine arrangement 13 is used to generate the power necessary for the CO2 capture system.

Appellants do not contest the Examiner's finding that DOE/NETL discloses a turbine arrangement including turbines of various pressures.

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operate Li's second steam turbine arrangement 13 when the CO2 capture system is not in use.

Final Act. 24; Appeal Br. 22. Further, Appellants do not assert error in the Examiner's proposed modification of Li's first turbine arrangement 15 to comprise steam turbines with at least two pressure levels. Final Act. 24; Appeal. Br. 23. Appellants' arguments are directed to the proposed modification of Li second steam turbine arrangement 13 with the teaching of Frutschi to include a high pressure steam turbine and a low pressure steam turbine, as called for in claim 1. Final Act. 25; Appeal Br. 22–23.

Appellants contend that Frutschi "discloses a combined gas steam power plant with a single gas turbine 2." Appeal Br. 22. Frutschi discloses more than Appellants acknowledge. In particular, Frutschi discloses a power plant including compressor 1, gas turbine 2, combustor 3 disposed between compressor 1 and gas turbine 2, and generator 10 coupled to the rotation of compressor 1 and gas turbine 2. Frutschi, col. 2, ll. 26–30, Figure. Flue gases flow from turbine 2 through waste heat boiler 4, and by heat exchange, steam generation is made available for feeding a downstream steam turbine 8. *Id.*, col. 2, ll. 38–42, Figure. Frutschi discloses that "a further steam turbine 9, which is, for example, a low-pressure turbine, may be inserted downstream of the first steam turbine 8." *Id.*, col. 2, ll. 42–45 (emphasis omitted). The Examiner relied on this teaching in Frutschi of low-pressure turbine 9 downstream of high-pressure steam turbine 8 as evidence that the claimed "second steam turbine arrangement" comprising a low-pressure steam turbine designed for a supply pressure that matches an outlet pressure of a back pressure turbine was known in the art at the time of Appellants' invention. Final Act. 25. The Examiner explains:

> It would have been obvious[] to one of ordinary skill in the art at the time of the invention[] that the inlet steam line (dashed line with valve (19) in Frutschi's sole figure) of the low pressure steam turbine (9) connected to the outlet steam line of back pressure turbine (8) meant that the low-pressure steam turbine (9) was designed for a supply pressure that matches an outlet pressure of a back pressure turbine (8) because Frutschi fails to disclose any pressure reducing or increasing devices in the steam supply line between the steam turbines.

Ans. 23.

We agree with the Examiner's findings and reasoning as to Frutschi. Frutschi discloses back pressure steam turbine 8 directly connected to low pressure steam turbine 9, and thus, the Examiner's determination that low pressure steam turbine 9 is designed for a supply pressure that matches an outlet pressure of back pressure steam turbine 8 is reasonable. Further, Appellants have not provided any argument as to error in the Examiner's stated reasons to modify Li's second steam turbine arrangement with the high-pressure steam turbine/low-pressure steam turbine arrangement of Frutschi. We find the Examiner has provided adequate explanation. Final Act. 25 (explaining that the two-turbine arrangement was known in the art and the modification would have yielded predictable results, i.e., to increase the efficiency of the plant by optimally utilizing the heat in the combustion gases).

Further, Appellants contend that "Li . . . in combination with Ross, Frutschi, DOE/NETL and Rollins, fails to disclose or suggest any expansion of steam using a low pressure turbine to match an outlet pressure of a back pressure turbine to selectively supply power to a CO2 capture system."

Appeal Br. 22–23. Claim 1 recites that the back pressure steam turbine and low pressure steam turbine "are both configured for a steam mass flow of the CO2 capture system . . . in order to convert thermal energy of an outlet steam of the back pressure steam turbine . . . into mechanical energy when the CO2 capture system . . . is not operating." Appeal Br., Claims App. 1. The Examiner's proposed modification to Li's second steam turbine arrangement 13 to modify it to include a back pressure steam turbine directly connected to a low pressure steam turbine, as taught by Frutschi, is addressed *supra*. The Examiner further proposed to modify Li's power plant to run this modified second steam turbine arrangement to generate electricity when the CO2 capture system is not in use so as to generate additional revenue. Final Act. 27. We find this reasoning to be based on rational underpinning, and Appellants have not addressed the Examiner's explanation directly in their arguments so as to demonstrate error in this reasoning. For these reasons, we sustain the rejection of claim 1, and of claims 2, 4, 5, and 10–12 which fall with claim 1, under 35 U.S.C. § 103(a) as unpatentable over Li, Ross, DOE/NETL, Frutschi, and Rollins.

Claim 8

Claim 8 depends from claim 1 and recites "wherein the low-pressure turbine 28 of the second steam turbine arrangement 15 is connectable to a generator 45, 5 by an overrunning clutch 23." Appeal Br., Claims App. 2. Appellants argue that "the Frutschi clutch relied upon by the Examiner is associated with a single gas turbine arrangement, and none of the cited documents relied upon by the Examiner teach or suggest any use of such a

clutch with two steam turbine arrangements as presently claimed." Appeal Br. 27.

As recited in claim 8, the Specification describes a second steam turbine arrangement 15 in which the low-pressure turbine 28 is connected to a generator 45 of the second steam turbine arrangement 15 by an overrunning clutch 23. Spec., Figs. 1–3. The Specification further describes an embodiment in which the low-pressure steam turbine 28 of the second steam turbine arrangement 15 is connected to a generator 5 of the first steam turbine arrangement 14 by overrunning clutch 23. Spec., Fig. 4. Claim 8 does not recite the location of the generator. The claim is construed under its broadest reasonable interpretation to encompass connection to a generator regardless of the generator's location. As such, the claim does not require a clutch connecting one steam turbine arrangement to another steam turbine arrangement.

As discussed *supra*, Li discloses two steam turbine arrangements 13, 15. Frutschi teaches that its low-pressure steam turbine 9 is connected to generator 10 through overrunning clutch 14. Frutschi, col. 2, ll. 61–64, col. 4, ll. 50–52, Figure. The second steam turbine arrangement 13 of Li, as modified by Frutschi, would include a low pressure steam turbine downstream of a back pressure steam turbine and a generator connected to this low pressure steam turbine by an overrunning clutch. Appellants' arguments appear to be directed to limitations not present in claim 8 and have not demonstrated error in the Examiner's reliance on Frutschi for teaching the subject matter of claim 8. For these reasons, we sustain the

rejection of claim 8 under 35 U.S.C. § 103(a) as unpatentable over Li, Ross, DOE/NETL, Frutschi, and Rollins.

Seventh Ground of Rejection

Appellants do not present any arguments addressing the rejection of dependent claim 9 as unpatentable over Li, Ross, DOE/NETL, Frutschi, Rollins, and Iijima. We understand Appellants to rely on their arguments presented in support of the patentability of claim 1 over the sixth ground of rejection. Having found no error in the sixth ground of rejection as to claim 1, we likewise sustain the rejection of dependent claim 9 as presented in the seventh ground of rejection.

Eighth Ground of Rejection

Appellants argue claims 6 and 7 as a group. Appeal Br. 24–25, 27. We select claim 6 as representative of this group. Claim 7 stands or falls with claim 6. 37 C.F.R. § 41.37(c)(1)(iv).

Appellants contend that the two steam turbine arrangements[5] of independent claim 6 "allow the power plant to provide increased power

[5] In particular, Appellants identify the features of the steam turbine arrangements of claim 6 as "at least one back pressure turbine configured to expand steam to a supply pressure of the CO2 capture system," "[t]he second steam turbine arrangement can include a low-pressure steam turbine, designed for a supply pressure that matches an outlet pressure of the at least one back pressure turbine," and "[t]he at least one back pressure steam turbine and the low-pressure steam turbine can both be configured for a steam mass flow of the CO2 capture system in order to convert thermal

output from the two steam turbine arrangements when the CO2 capture system is not in operation." Appeal Br. 24. Appellants contend that "[t]he foregoing features and advantages are not disclosed or suggested in the Li document considered individually, or in combination with the Ross, Kataoka et al., Frutschi, DOE/NETL and Rollins documents in the manner relied upon by the Examiner." *Id.* (referring to discussion of Li, Ross, Frutschi, DOE/NETL, and Rollins presented in response to prior rejections in the Appeal Brief). To the extent Appellants rely on the same assertions of error with regard to these references discussed *supra*, these arguments are not convincing.

With regard to Kataoka, Appellants argue only that Kataoka "discloses a power plant with a single turbine arrangement." Appeal Br. 24. The Examiner relied on Li to disclose dual steam turbine arrangements (13, 15). Final Act. 39. For the reasons discussed *supra*, we agree with the Examiner's findings as to Li. The Examiner relied on Kataoka with regard to claim 6 to teach a stack, and proposed to modify the power plant of Li to have a stack. *Id.* at 40. As such, Appellants' arguments as to Kataoka do not demonstrate error in the rejection of claim 6. Accordingly, we sustain claim 6, and dependent claim 7 which falls with claim 6, as unpatentable under 35 U.S.C. § 103(a) over Li, Ross, Kataoka, Frutschi, DOE/NETL, and Rollins.

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energy of an outlet steam of the back pressure steam turbine into mechanical energy when the CO2 capture system is not operating." Appeal Br. 24.

Ninth Ground of Rejection

Appellants argue claims 13–15 as a group. Appeal Br. 25, 27. We select claim 13 as representative of this group. Claims 14 and 15 stand or fall with claim 13. 37 C.F.R. § 41.37(c)(1)(iv).

Appellants contend that "[t]he documents relied upon by the Examiner, such as the primary reference to DOE/NETL Fig. 3-21, teach away from Appellants' Claim 13 combination, which includes, for example operating two steam turbine arrangements when a CO2 capture system is not in operation." Appeal Br. 25.

The Examiner provides an annotated version of Figure 3-21 of DOE/NETL in which the Examiner identified the first and second steam turbine arrangements. Final Act. 29, 43. The Examiner acknowledges that "DOE/NETL is silent on . . . operating both steam turbine arrangements using all available steam to produce power when the CO2 capture system . . . is not in operation." *Id.* at 44. The Examiner, however, relies upon the same findings and reasoning as set forth in the rejections of claims 1 and 6, discussed *supra*, to explain why it would have been obvious to modify the power plant of DOE/NETL "with a low-pressure steam turbine designed for a supply pressure that matches an outlet pressure of a back pressure turbine taught by Frutschi" and further modify the power plant, in light of Rollins, "to use the thermal energy not used by the non-operational CO2 capture system to generate electricity which could generate revenues of $3,913 to $65,230 per hour at 1999 power prices." *Id.* at 45.

Appellants' bald assertion that DOE/NETL teaches away from using thermal energy from both steam turbine arrangements to generate electricity when the CO2 capture system is not in use, without any further explanation, is not persuasive. Further, Appellants' arguments do not specifically address or assert error in the reasoning provided by the Examiner. For these reasons, we are not apprised of error in the Examiner's rejection of claims 13–15 under 35 U.S.C. § 103(a) as unpatentable over DOE/NETL, Frutschi, and Rollins.

Tenth Ground of Rejection

Independent claim 16 is directed to a method for retrofitting a power plant with a CO2 capture system. Appellants argue:

> The documents relied upon by the Examiner fail to teach or suggest any retrofitting of a power plant with a carbon capture system 12 during operation, the power plant having <u>two</u> steam turbine arrangements one of which is configured to supply output power but which is also matched to a retrofit carbon capture system 12. The DOE/NETL document does not disclose or suggest any such feature. For example, the DOE/NETL document fails to disclose or suggest inclusion of a steam turbine "configured to expand steam to the supply pressure of the CO2 capture system" to allow for such a retrofit without plant shutdown or commissioning of any additional steam arrangement.

Appeal Br. 26. Appellants' arguments are based on limitations not present in claim 16. Ans. 33–34. For example, claim 16 does not recite that retrofit occurs without plant shutdown or commissioning of any additional steam arrangement. Rather, claim 16 recites that the CO2 capture system is built

"while the power plant . . . is operating, operation of the power plant . . . is only interrupted for connection of the CO2 capture system . . . and for subsequent recommissioning." Appeal Br., Claims App. 4.

As discussed *supra*, the Examiner finds that DOE/NETL teaches a power plant having two steam turbine arrangements, including a first steam turbine arrangement comprising steam turbines with at least two pressure levels and a second steam turbine arrangement comprising at least one back pressure turbine configured to expand steam to the supply pressure of the CO2 capture system. Final Act. 29, 47. We agree with these findings. In particular, DOE/NETL shows a water-steam cycle power plant having a first steam turbine arrangement that includes low, intermediate, and high pressure turbines. DOE/NETL, Fig. 3-21; Final Act. 29. DOE/NETL describes a second steam turbine arrangement includes a "let down steam turbine generator" where "[e]xtracted steam will feed the new let down steam turbine generator and reclaim system of the amine CO_2 recovery system." DOE/NETL at 96; *see also* Final Act. 29. "The exhaust of the let down steam turbine generator (LSTG) ultimately provides the feed steam for the reboilers." DOE/NETL at 96.

The Examiner further finds that DOE/NETL teaches "a power plant with flue gas ducting and a stack prepared for retrofitting a CO2 capture system and space arranged to allow retrofitting of the CO2 capture system." Final Act. 47 (citing DOE/NETL, p. ES-2). The Examiner acknowledges that "DOE/NETL is silent on building the CO2 capture system while the power plant is operating, operation of the power plant is only interrupted for

connection of the CO2 capture system . . . and for subsequent recommissioning." *Id.* at 48. The Examiner proposes to modify DOE/NETL, in light of the disclosure in DOE/NETL that retrofitting would take three years to complete and in light of the disclosure in Rollins of the price for electricity in the summer of 1999, to build the CO2 capture system while the power plant is operating, operation of the power plant is only interrupted for connection of the CO2 capture system, and for subsequent recommissioning, so that the power plant would continue operating during the retrofitting to generate revenue from electricity sales. *Id.* at 48–49; *see also* Ans. 33–35. We find the Examiner's reasoning is based on rational underpinning, and Appellants do not address the Examiner's reasoning in their arguments. For these reasons, we sustain the rejection of claim 16 under 35 U.S.C. § 103(a) as unpatentable over DOE/NETL and Rollins.

Eleventh Ground of Rejection

Appellants do not present any arguments addressing the rejection of dependent claims 17 and 18 as unpatentable over DOE/NETL, Rollins, Hustad, and Han. We understand Appellants to rely on their arguments presented in support of the patentability of claim 16 over the tenth ground of rejection. Having found no error in the tenth ground of rejection as to claim 16, we likewise sustain the rejection of dependent claims 17 and 18 as presented in the eleventh ground of rejection.

DECISION

The rejection of claims 1, 2, 4, 5, 12, and 16 under 35 U.S.C. § 112, second paragraph, is reversed.

The rejection of claims 1 and 12 under 35 U.S.C. § 102(b) is affirmed.

The rejections of claims 1, 2, and 4–18 under 35 U.S.C. § 103(a) are affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED